

Product Data

Multi-gas Monitor — Type 1302

USES:

- m Quantitative analysis of up to 5 components and water vapour in gas mixtures
- m Occupational health and safety measurements
- m Indoor air-quality and ventilation measurements
- m Detection of accidental releases of gases/vapours

FEATURES:

- m Selectively measures a wide range of gases/vapours
- m Linear response over a wide dynamic range
- m Extremely reliable due to self-testing procedures
- m High stability (low drift) makes calibration only necessary about four times a year

- m User-friendly — easily operated by non-technical personnel
- m Accurate — compensates for temperature fluctuations, water-vapour interference and interference from other known gases
- m Extensive data-storage capacity
- m Equipped with RS-232-C and IEEE 488 interfaces for data transfer/remote control
- m Portable
- m Operates immediately — no warm-up time necessary
- m Immediate display of measurement results
- m Collects samples from points up to 50m away
- m Used with one/two Multipoint Doser and Sampler Units Type 1303 or one Multipoint Sampler Type 1309, it can monitor air samples collected from 6/12 different locations

Introduction

The Brüel & Kjær Innova Multi-gas Monitor Type 1302 is a highly accurate, reliable and stable quantitative gas monitor. Its measurement principle is based on the photoacoustic infra-red detection method. This means that the 1302 can measure almost any gas which absorbs infra-red light. Appropriate optical filters (up to 5) are installed in the 1302's filter carousel so that it can selectively measure the concentration of up to 5 component gases and water vapour in any air sample. The 1302's detection limit is gas-dependent but typically in the 10^{-2} ppm region.

Reliability of measurement results is ensured by the regular self-tests which the 1302 performs. Accuracy is ensured by the 1302's ability to compensate any measurement for temperature fluctuations, water-vapour interference and interference from other gases known to be present.

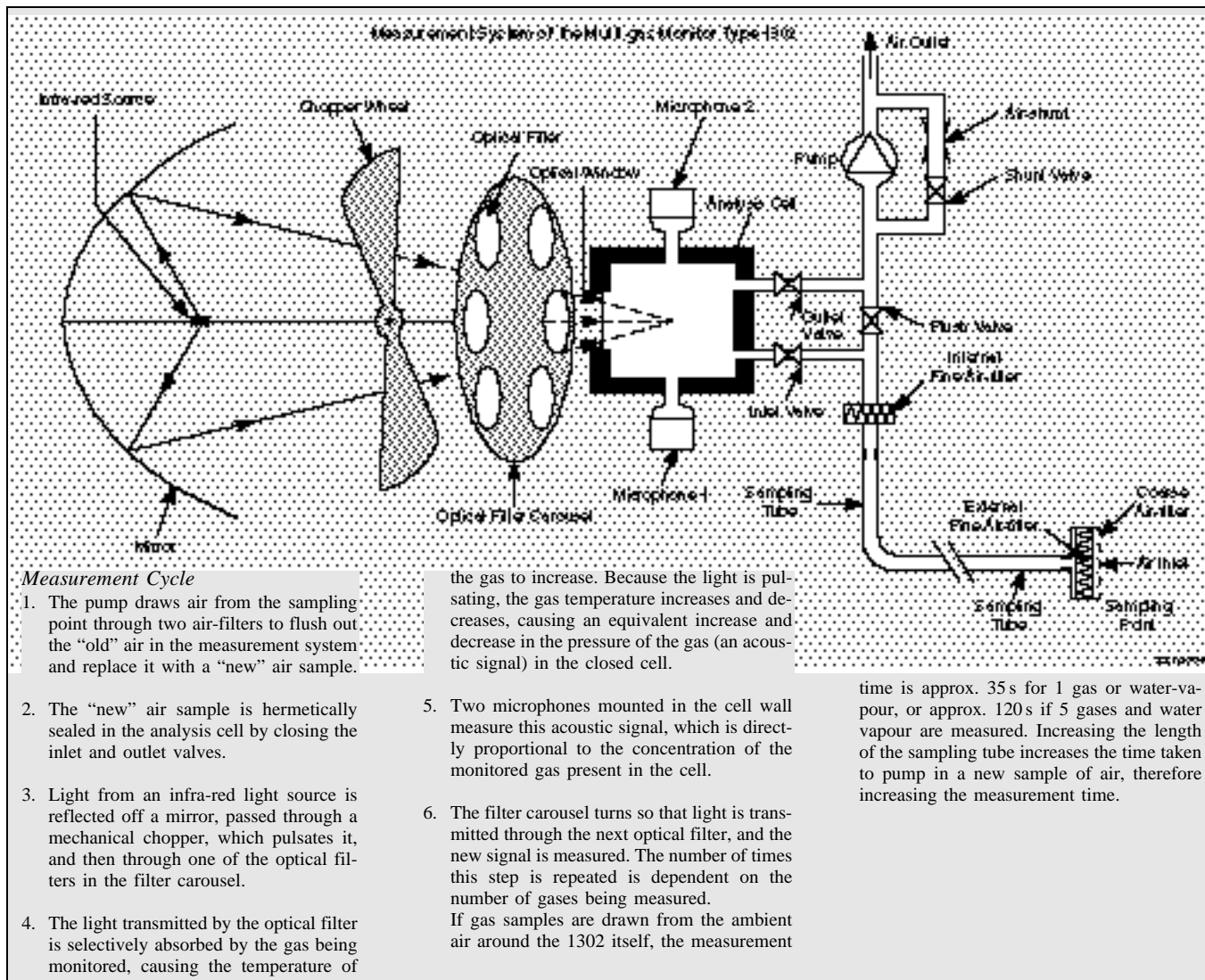
The Multi-gas Monitor is easily operated via its front-panel push-keys. Each time a push-key is pressed, a short explanatory text appears on the 1302's display screen which guides the user through each operating procedure. Therefore, no special training is required to operate the 1302.



Users can set-up the 1302 to perform almost any type of monitoring task. Measurement results are displayed on the 2×40 character screen as soon as they are available (approx. 35s for one gas, 120s for 5 gases and water vapour). These results are automatically stored in the 1302's large memory and can be printed or plotted at a later stage.

The 1302 has a sturdy, dust-proof casing to protect its components. It is portable, and requires no warm-up time or re-calibration after moving — making it ideal for short-term monitoring of air samples drawn from its immediate environment. For long-term monitoring the 1302 is placed indoors and collects air samples for analysis, via tubing, from points up to 50m away.

Measurement System of the Multi-gas Monitor Type 1302



Selectivity

The selectivity of the 1302 is determined by the optical filters installed in its filter carousel. A wide range of narrow-band optical filters is available from Brüel & Kjær Innova. By studying the absorption spectra of the gases to be monitored, as well as those of any other gases which may be found in the ambient air in the same area, the most appropriate optical filters can be chosen. Please refer to the Product Data Sheet for the Optical Filters for details.

Water vapour, which is nearly always present in ambient air, absorbs infra-red light at most wavelengths so that, irrespective of which optical filter is used, water vapour will contribute to the total acoustic signal in the analysis cell. The higher the concentration of water vapour in the cell, the more it contributes to the measured signal. However, a special optical filter is permanently installed in the filter carousel of the 1302 which allows water-vapour's contribution to be measured separately during each measurement cycle. The 1302 is thus able to compensate for water-vapour's interference.

Any other interferent gas, which is known to be present in the ambient air, can be compensated for in a similar fashion. By installing an optical filter to selectively measure the concentration of the interferent gas, the user can set-up the 1302 to compensate for the interferent gas's contribution.

Calibration

After installing the relevant optical filters, the Multi-gas Monitor is zero-point calibrated (using clean, dry air or N_2), humidity-interference calibrated (using clean, wet air or N_2), and then span-calibrated (using a concentration of at least 100 times the detection limit of each of the gases to be monitored). Calibration is very easy — the user is guided through the procedure by the directions displayed on the 1302's screen. Due to the 1302's high stability (low drift), calibration is seldom necessary more than four times a year.

Operation

The 1302 is operated by using the push-keys on its front panel. Short explanatory texts appear on the 1302's display screen to guide the operator in the use of these push-keys. There are four different operation modes: Set-Up; Measurement; Memory; and Function.

Set-Up Mode

When the 1302 is operated in Set-Up mode, the user selects the parameters which define a particular monitoring task (see Table.1). Details of up to 10 different monitoring tasks can be stored in the 1302's memory. Each monitoring task set-up is given a number from 1–10.

When operating in Set-Up mode, users can also select the parameters which determine, for example: the units of measurement (e.g. ppm or mg/m^3); the interface parameters for printing/plotting of measurement data; the time-period over which measurements can be averaged (e.g. 15min. if Short Term Exposure Levels (STEL) are required).

User-defined Monitoring Task
Monitor gas A?/B?/C?/D?/E? Monitor water vapour (Yes/No)? Continuous sampling (Yes/No)? Sampling Interval Total Monitoring Period? Compensate for Water Vapour? Cross-compensate for interference

Table 1 Monitoring-task "set-up" parameters which are user-definable

Measurement Mode

Operating in this mode, the user selects the monitoring task the 1302 will perform, and the start-time of the task. The 1302's internal clock will automatically start the task at the pre-determined time. If a fixed monitoring period is chosen, the 1302 will automatically stop the task at the end of the monitoring period; otherwise the 1302 stops when switched-off manually.

Memory Mode

During a monitoring task all results are stored in a memory called *Display Memory*. While operating in Memory mode, data in this memory can be copied into the 1302's other memory (*Background Memory*) to prevent it being overwritten by results from the next task.

Data stored in *Background Memory* can be recalled to *Display Memory*, where the user can scroll through the results on the 1302's screen. Data can also be deleted from *Background Memory*, so new data to be stored in it.

Function Mode

In this mode the user can set up the 1302 to automatically perform almost any sequence of operations over any period of time. Using the front-panel push-keys, the user keys-in the desired sequence of operations. This is stored in the 1302's memory, and the operation sequence automatically performed on request. A key sequence could, for example, be used to set up the 1302 to perform three different monitoring tasks during three consecutive work-shifts in a factory manufacturing 24 hours a day.

Measurement Results

Gas-measurement results are displayed on the 1302's screen as soon as they are available, and are constantly updated. During a task, the 1302 performs a running statistical analysis of measured gas concentrations, calculating for each monitored gas: the Mean Value; the Standard Deviation; and the Maximum and Minimum measured concentrations. The Mean Value is the same as the Time-Weighted Average (TWA) value during the total monitoring period.

The individual results stored in *Display Memory* can also be automatically averaged and presented on the display.

Measurement data stored in the 1302's *Display Memory* can be printed out in list form on any standard text-printer, via the IEEE488 or RS-232-C interfaces. Data can also be plotted graphically using a graphics plotter.

If any interesting or unusual event occurs during a monitoring task, the measurement being performed at this time can be "marked". This enables the user to assess the event's affect on the monitoring task.

Remote Control

The Multi-gas Monitor Type 1302 can be remotely controlled from a computer via the RS-232-C or the IEEE488 interface. Brüel & Kjær Innova offer two application software programs, Application Software Type 7300 and Application Software Type 7620.

Using the Type 7300, a computer can remotely control either a 1302 alone, or the 1302 together with one Multipoint Sampler Type 1309 for sequentially monitoring air-samples from up to 12 locations (see Fig. 1).

Using the Type 7620, a computer can control either a 1302 alone, or up to two Type 1303 Multipoint Sampler and Doser Units for sequentially monitoring air-samples from up to 12 locations. Alternatively, these locations can be dosed with a tracer-gas and air-samples drawn from each location for analysis by the 1302 (see Fig. 1). The software uses the resultant measurements to calculate the air-change or ventilation efficiency of each location.

Reliability

Reliability is ensured by the series of self-tests which the 1302 performs. The self-tests check software, data integrity, and the components

of the 1302 to ensure that they function properly. If any fault is found, it is reported in the measurement results so that users can see what, if anything, has affected the accuracy of the measurement. If there is an AC mains power-supply failure the 1302 will automatically start-up again when power is restored.

Maintenance

The only maintenance tasks necessary are calibration and changing the filters in the internal and external air-filtration units of the 1302. Both tasks are easily performed, and are typically necessary only four times a year.

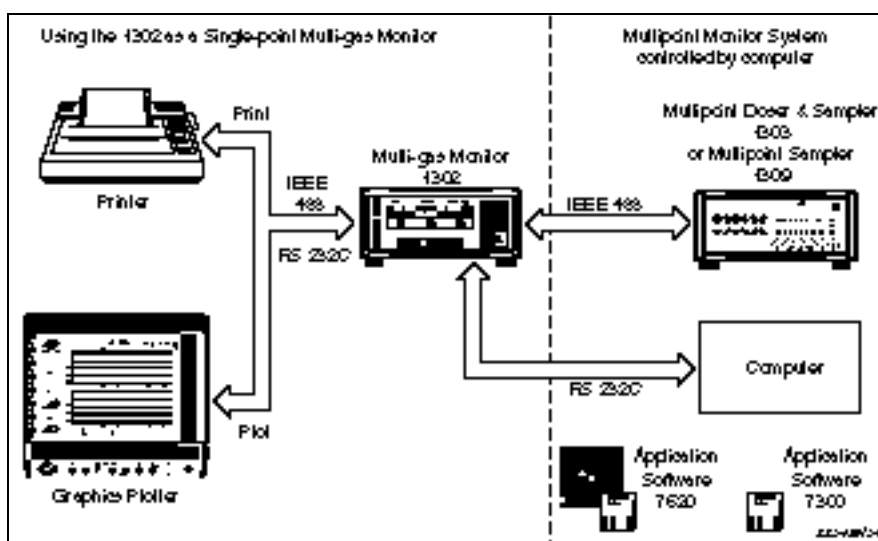


Fig. 1 Using the Multi-gas Monitor Type 1302 alone, as a single-point multi-gas monitor, or together with a 1303 in a multipoint multi-gas monitoring system controlled by computer using available software

Specifications 1302

WARNING! The 1302 must not be placed in areas with flammable gases/vapours in explosive concentrations, or be used to monitor explosive concentrations of these. Also, monitoring of certain aggressive gases, or a very high concentration of water vapour, could damage the 1302. Ask your local Brüel & Kjær Innova representative for further information.

All terms relating to gas analysis are in accordance with the definitions set out in the ISO Draft International Standard 8158
Your local Brüel & Kjær Innova representative will assist in the selection of suitable optical filters. Details are provided in the "Optical Filters" Product Data Sheet and the Gas Detection Limits wall-chart.

MEASUREMENT TECHNIQUE:
Photoacoustic infra-red spectroscopy

RESPONSE TIME:
(including cell purging) dependent on the number of gases being measured, and length of sampling tube used. If the tube is less than 1m, response time is ~35 s (one gas or water vapour), and ~120 s (5 gases and water vapour). Using a longer tube increases response time

MEASUREMENT RANGE:
Detection Limit: gas-dependent, but typically ranges from 10^{-2} parts/million (ppm) to 1 ppm (see Gas Detection Limits wallchart)
Dynamic Range: five orders of magnitude (i.e. upper limit = 100000 times the detection limit). To measure over this wide dynamic range, span-calibration must be performed with two different gas concentrations


MEASUREMENT UNITS:
In mg/m^3 and parts/million (ppm) normalized to the temperature entered by the user

ACCURACY:
Zero Drift: Typically \pm Detection limit per 3 months
Influence of temperature: $\pm 10\%$ of detection limit/ $^{\circ}\text{C}$
Influence of pressure: $\pm 0.5\%$ of detection limit/mbar
A concentration of $100\times$ detection limit was used in determining these specifications:
Repeatability: 1% of measured value
Range Drift: $\pm 2.5\%$ of measured value per 3 months
Influence of temperature: $\pm 0.3\%$ of measured value/ $^{\circ}\text{C}$
Influence of pressure: $- 0.01\%$ of measured value/mbar
Reference conditions:
• Measured at 20°C , 1013 mbar, and relative humidity (RH): 60%
♦ Measured at 1013 mbar, and RH: 60%

♥ Measured at 20°C and RH: 60%
INTERFERENCE:
The 1302 automatically compensates for temperature fluctuations in its analysis cell, and can compensate for water vapour in the air sample. If an optical filter is installed to measure a known interferent, the 1302 can cross-compensate for the interferent

DATA STORAGE CAPACITY:
Dependent on the number of gases being measured. Sufficient for a 12-day monitoring task, monitoring 5 gases and water vapour every 10 min
GENERAL:
Dimensions:
Height: 175 mm (6.9 in)
Width: 395 mm (15.6 in)
Depth: 300 mm (11.8 in)
Weight: 9 kg (19.8 lbs)
Maximum Pumping Rate: $30\text{cm}^3/\text{s}$ (purging sampling tube) and $5\text{cm}^3/\text{s}$ (purging analysis cell)

COMPLIANCE WITH STANDARDS:

	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive.
Safety	EN 61010-1 (1993) & IEC1010-1 (1990): Safety requirements for electrical equipment for measurement, control and laboratory use.
EMC Emission	EN 50081-1 (1992): Generic emission standard. Part 1: Residential, commercial and light industry. EN 50081-2 (1993): Generic emission standard. Part 2: Industrial environment. CISPR 22 (1993): Limits and methods of radio disturbance characteristics of information technology equipment. Class B Limits. FCC Class B limits.
EMC Immunity	EN 50082-1 (1992): Generic immunity standard. Part 1: Residential, commercial and light industry. RF immunity implies that gas concentration indications greater than 150 times the detection limit will be affected by no more than $\pm 5\%$. EN 50082-2 (1995): Generic immunity standard. Part 2: Industrial environment. RF immunity implies that gas concentration indications greater than 500 times the detection limit will be affected by no more than $\pm 5\%$. Note: The above is guaranteed using accessories listed in this Product Data sheet only.
Temperature	IEC 68-2-1 & IEC68-2-2: Environmental Testing. Cold and Dry Heat. Operating Temperature: $+5^{\circ}\text{C}$ to $+40^{\circ}\text{C}$ ($+41^{\circ}\text{F}$ to $+104^{\circ}\text{F}$) Storage Temperature: -25 to $+70^{\circ}\text{C}$ (-13°F to $+158^{\circ}\text{F}$)
Humidity	IEC 68-2-3: 90% RH (non-condensing at 30°C)
Enclosure	IEC 529: IP 20
Mechanical	IEC 68-2-6: Vibration: 0.3 mm , 20 m/s^2 , 10-500 Hz IEC 68-2-27: Shock: 1000 m/s^2 IEC 68-2-29: Bump: 3000 bumps at 250 m/s^2

Volume of Air required per sample:(using 1m sampling tube) $140\text{cm}^3/\text{sample}$
Power Requirement: 100 – 127V and 200 – 240V (50 – 400 Hz) $\pm 10\%$ AC. Complies with IEC536 Class 1 Safety Standards
Power Consumption: ~100VA
Alarm Relay Socket: for connection to one or two alarm relays (visual/audio). Alarm levels for each gas are user-defined
Acoustic Sensitivity: not influenced by external sound
Vibration Sensitivity: complies with IEC 682-6. Strong vibrations at 20Hz can affect the detection limit
Back-up Battery: 3V lithium battery, life-time 5years. This protects data stored in memory, and powers the internal clock

COMMUNICATION:
The 1302 has an IEEE488 and an RS-232-C interface, for data exchange and remote control of the 1302. The RS-232-C baud-rate is from 300 – 9600

Ordering Information

<p>Type 1302 Multi-gas Monitor</p> <p>The 1302 is delivered zero-point and humidity-interference calibrated. Optical filters necessary for the user's monitoring task can be ordered together with the 1302, and installed by Brüel & Kjær Innova.</p> <p>Includes following Accessories:</p> <p>8× DL 3322: Optical filter locking springs UD 5023: External air-filter unit DS 0759: Filters (25) for air-filter unit QA 0164: Tweezers QA 0170: Tool for locking spring Calibration Kit comprising: UD 5001: Y-piece 2× YM0652: Threaded Nuts AT 2177: PTFE tubing UD 5037: ®Nafion (copolymer of TFE & fluorosulphonyl monomer) tubing 2× UD 5046: Fittings for tubing</p>	<p>QH 0029: "User's Guide to the Set-up Tree" DH 0541: Shoulder strap Mains cable Instruction Manual</p> <hr/> <p>Optional Accessories</p> <p>The 1302 can be span-calibrated for certain gases (option UA1098) — contact your local Brüel & Kjær Innova representative for details of the gases for which this can be done.</p> <p>UA 0968 – UA 0988 and UA 0936: Optical Filters (22) EB 6009: Optical Filter EB 6010: Optical Filter UA 1098: Span Calibration AO0265: IEEE–IEEE Interface cable AO0264: IEEE–IEC625 Interface cable WL 0946: RS-232-C Interface cable (25pin–25pin) null-modem included</p>	<p>WL 0945: RS-232-C Interface cable (9pin–25pin) null-modem included JP 0600: 6-pin DIN plug (male) with locking collar for alarm relay AF 0614: PTFE tubing ET 6006: Calibration Program for 1302 WB 1318: Analog Output WQ 0943: Battery Back-pack WQ 0916: Water-trap Filter WQ 1106: Filter cartridges (3) for use with WQ 0916 EA 6001: Closed-loop Calibration Kit Type1303: Multipoint Sampler & Doser Unit Type1309: Multipoint Sampler Type7300: Application Software Type7620: Application Software</p>
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Brüel & Kjær Innova reserves the right to change specifications and accessories without notice



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